

MONTHLY WEATHER REVIEW,

OCTOBER, 1877.

WAR DEPARTMENT,

Office of the Chief Signal Officer,

DIVISION OF

TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

INTRODUCTION.

The present REVIEW for the month of October depends upon official data received up to the 14th of November from the Canadian Meteorological Office; the United States Navy; the Army Post Surgeons; the Voluntary and Regular Observers of the United States Signal Service. The most interesting features of the month have been: *First*, The severe storms Nos. I and VII. *Second*, The general excess of rain-fall, especially in the Gulf States. *Third*, The continuation of high temperatures and low pressures, except in Canada. *Fourth*, The very low water in the upper Ohio and Mississippi. *Fifth*, The heavy snows and early winter at Pike's Peak and other high stations in the Rocky Mountains. *Sixth*, Infrequency of thunder and lightning and auroras. *Seventh*, The absence of frosts and the remarkably mild autumn weather, allowing second crops to ripen in some localities. *Eighth*, Almost entire absence of solar spots.

BAROMETRIC PRESSURE.

In General.—The general distribution of atmospheric pressure for the month is shown by the isobars on map No. II, from which it appears that the area of highest pressure, or that included within the isobar of 30.05, covers the Middle and South Atlantic and interior of the Gulf States, and the area of lowest pressure is in the extreme Northwest. In the Octobers of 1873, 1874, 1875 and 1876, the highest mean pressure existed in the Lower Mississippi valley, but for October of this year it is found extending over eastern Tennessee and the Carolinas. On the average the pressures are below the normal in all sections, except in Canada and the northern portions of the Lake region and New England.

Barometric Ranges.—The general range of pressure (as reduced to sea-level,) is shown by the following table, which gives the highest and lowest pressures at the centres of high and low areas, and from which it appears that for the whole country a range of 1.42 inches has been recorded:

LOW AREAS.				HIGH AREAS.			
No.	Location.	Date.	Minimum Pressure.	No.	Location.	Date.	Maximum Pressure.
I	St. Lawrence valley....	Oct. 1st, 7:35 a. m.....	29.73	I	Middle Atlantic coast....	Oct. 1st, 7:35 a. m.....	30.25
II	Northern Florida.....	Oct. 3rd, 7:35 a. m.....	29.19	II	Gulf of St. Lawrence....	Oct. 3rd, 7:35 a. m.....	30.27
III	Canada.....	Oct. 4th, 7:35 a. m.....	29.35	III	Cape Breton.....	Oct. 9th, 7:35 a. m.....	30.61
IV	Lake Huron.....	Oct. 8th, 4:35 p. m.....	29.63	IV	Eastern Tennessee.....	Oct. 9th, 7:35 a. m.....	30.24
V	Lake Huron.....	Oct. 10th, 4:35 p. m.....	29.66	V	East Tennessee & N. C.....	Oct. 13th, 7:35 a. m.....	30.40
VI	Kansas.....	Oct. 12th, 4:35 p. m.....	29.50	VI	Canada.....	Oct. 17th, 7:35 a. m.....	30.32
VII	Cape Breton.....	Oct. 22nd, 11 p. m.....	29.31	VII	Manitoba.....	Oct. 19th, 7:35 a. m.....	30.58
VIII	Dakota.....	Oct. 23rd, 4:35 p. m.....	29.44	VIII	North Carolina coast....	Oct. 29th, 7:35 a. m.....	30.28
IX	Dakota.....	Oct. 23rd, 4:35 p. m.....	29.31	IX	Oregon.....	Oct. 29th, 7:35 a. m.....	30.48
X	North Carolina coast....	Oct. 28th, 11 p. m.....	29.61				
XI	St. Lawrence valley....	Oct. 29th, 4:35 p. m.....	29.32				
XII	Canada.....	Oct. 31st, 7:35 a. m.....	29.65				

The local barometric ranges have been as follows: *Large Ranges*—Atlantic City, 1.22; Barnegat, 1.23; Bismarck, 1.27; Fort Whipple, 1.25; Washington, 1.21. *Small Ranges*—Brackettville, 0.65; Cheyenne, 0.52; Corsicana, 0.70; Denison, 0.69; Denver, 0.59; Eagle Pass, 0.65; Fort Gibson, 0.67; Fort Sill, 0.69; Galveston, 0.52; Indianola, 0.53; Key West, 0.35; La Crosse, 0.69; Memphis, 0.65; Mason, 0.65; Nashville, 0.70; Pike's Peak, 0.63; Red Bluff, 0.36; St. Paul, 0.68; Salt Lake City, 0.50; Santa Fé, 0.48; Shreveport, 0.61; Sacramento, 0.33; San Antonio, 0.53; Vicksburg, 0.70; Visalia, 0.36; Winnemucca, 0.45.

Areas of high pressure have been more numerous than in September, and the pressures somewhat higher. In detail they have occurred as follows:

No. I.—This was the area of high pressure No. IV described in the September Review, and existed on the 1st of the month along the Middle and New England coasts, before the pressure commenced falling in advance of the Gulf cyclone.

No. II.—On the 1st the pressure rose in Minnesota and Manitoba, with northerly winds veering to easterly, and on the 2nd in the St. Lawrence valley in rear of low pressure No. I, indicating that there was an area of high pressure moving southeastwardly over Hudson's Bay Territory; during the 2nd and 3rd this area passed southeastwardly over the Gulf of St. Lawrence to the Atlantic ocean.

No. III.—This high pressure area is probably the one that existed in Oregon and Washington Territory on the 2nd and 3rd. On the morning of the 3rd the pressure was quite high in Idaho and Utah, and during the day, brisk to high north and northwest winds prevailed from Wyoming and Kansas northeastward to Dakota and Minnesota. During the latter part of the 3rd and early part of the 4th, this area passed rapidly down the Missouri valley, and by night extended from Minnesota to Louisiana, with diminished central pressure but increased area. During the 5th and until the morning of the 6th, the centre appeared to remain nearly stationary in the central Mississippi valley, the pressure increasing rapidly during the night and extending eastward to the Atlantic coast in rear of the Gulf cyclone. During the latter part of the 6th the pressure commenced falling throughout the Mississippi valley, in advance of low pressure No. IV, thus transferring the centre of high pressure on the morning of the 7th to the Atlantic States. On the morning of the 8th the highest pressure was over the Gulf of St. Lawrence, and its influence was not withdrawn from lower Canada until the 11th.

No. IV.—On the 7th the pressure commenced increasing in the southwest, and a distinct area of high pressure existed in the Southern States until the morning of the 10th, when it became a part of high area No. V.

No. V.—This area appeared in Manitoba on the morning of the 9th, and, during the day, extended southward to Kansas. On the 10th, it progressed southeastward, and, by 11 p. m., covered the Mississippi valley. On the 11th, it moved slowly eastward, and, by 11 p. m., covered the country from the Upper Lake region to the East Gulf coast, and, at 11 p. m. of the 12th, extended from the Lower Lake region to the South Atlantic coast. On the 13th, rising barometer and northerly winds prevailed over the St. Lawrence valley, where the pressure remained high until the night of the 15th; the centre of highest pressure, however, remaining in the South Atlantic States until the morning of the 16th, when the barometer commenced falling in this section.

No. VI.—The barometer rose rapidly on the 13th in Oregon, while the low area, No. VI., prevailed to the west of the Mississippi. On the 15th, the pressure rose rapidly at the Rocky Mountain stations and in Manitoba. On the morning of the 16th, the area of highest pressure was apparently central north of Lake Superior, whence it extended eastward, and, on the morning of the 17th, extended over the country from St. James' Bay to the Middle Atlantic coast. During the 17th, this area of high pressure was entirely dissipated.

No. VII.—The barometer continued high in Manitoba during the 17th, and on the 18th began rising rapidly, with northerly winds and clear weather. The pressure was highest in Manitoba on the 19th, at 7:35 a. m., and the central high area moved slowly southeastward, reaching Iowa on the morning of the 21st, at which time the centre of low barometer No. VII was in West Virginia. The area of high pressure now moved southward to the Gulf coast, where light "northers" prevailed on the 21st and 22d. The central highest pressure was in Texas on the 22d, at 7:35 a. m.; in Tennessee on the 23d, 7:35 a. m.; in South Carolina on the 24th, 7:35 a. m., and off the South Atlantic coast on the morning of the 25th.

No. VIII.—On the 25th an area of rising barometer extended southward, giving rise to cold northeast winds, cloudy and rainy weather over the Lake region and St. Lawrence valley. On the 26th, at 7:35 a. m., the highest pressure was central, with cold, clear weather in the St. Lawrence valley, whence it extended southeastward over New England in rear of low area No. X, which was then off the North Carolina coast. The pressure subsequently rose in the South Atlantic States more rapidly than in New England, and on the 28th at 7:35 a. m., was highest in North Carolina, where it remained until the 30th.

No. IX.—The pressure rose on the 27th in Oregon, while low No. XI was in the Missouri valley, and a general depression, as shown by the deviations from normal values, prevailed from the Sierra Nevada mountains eastward to the Alleghanies. This depression was followed by a rapid rise in the British Possessions, and on the 29th, at 7:35 a. m., an area of high pressure was central in the Lower Missouri valley, whence it extended slowly southeastward, while the central highest pressure moved southward over the West Gulf States.

Areas of Low Pressure in General.—During the month of October twelve areas of low pressure existed within the limits of our stations, eleven of which followed the courses shown by the tracks on chart No. II. Seven of these originated or first appeared in the region between the Rocky Mountains and the Mississippi valley; three of which travelled eastward to the Atlantic, and three others after moving southward to the Mississippi valley, moved northeastward into Canada. Two (Nos. VII and X) possibly originated in the Southwest and moved northeastward. No. I was the Gulf cyclone. Three of them (Nos. I, VII and X) were accompanied by heavy rains and two (Nos. I and VII) by hurricane winds.

Areas of Low Pressure.—No. I.—From information subsequently received it appears that the hurricane mentioned in the September Review as occurring at St. Vincent and Grenada on September 21st, and the cyclone of the 27th in the Caribbean Sea, relate to the same storm, whose track was about, approximately, as follows: On the 21st it passed over or near to Barbadoes, St. Vincent and Grenada. On the midnight of the 22-23rd it is reported to have passed about 250 miles south of Porto Rico. On the 23rd it passed over Buen Ayre and Curacao. The report of the United States Consul at the latter place states that the damage to property is estimated at \$2,000,000, and that the loss of life was undoubtedly large. In the city of Curacao the most solid buildings were swept down by the waves, and throughout the island planters suffered largely. Much damage to shipping is also reported. On the 25th the Bark Herald was wrecked at the mouth of Milk river, Jamaica, in a southwest hurricane, at which time the vortex was probably 200 miles distant in a SSW. direction. On September 27th and 28th Schooner Alice Vane, at Hog Island, on the coast of Honduras, experienced a hurricane, at which time the vortex was probably passing northwestward about midway between the Honduras coast and the west end of Cuba. (Two reports by the Schooners Wm. R. Knighton and Wm. Thompson, of hurricanes experienced by them on the 23rd, while they were in harbor, respectively, at Roatan and Bonaceo, must refer, if there be no mistake, to a previous hurricane, possibly that numbered XI in the September Review.) The present cyclone was encountered by the Schooner Wm. Fisher on the 28th, while off Cap. San Antonio, Cuba, the wind being from SSE; she continued within the area of hurricane winds and completely in the power of the storm until the 4th of October, when she was stranded on Anclote Keys, lat. 23°, coast of Florida, by which time, as the track on chart No. 1 shows, the centre of lowest pressure had passed northward to Chesapeake Bay. On the 2nd, at 11 p. m., the vortex of the storm struck the coast of Florida, near St. Marks, whence it follows that its progress from the 28th to the 2nd had been very slow. Other reports of the storm have been received as follows: the steamship San Antonio, September 29th, 200 miles south of New Orleans, reports a northeast hurricane in the evening, and by the evening of the 30th wind had veered to east, but during the whole of October 1st again experienced a northeast hurricane; on October 2nd, 3 a. m., being about 150 miles south of New Orleans the wind backed to a violent hurricane from the Northwest; the lowest barometer, 29.15, occurred about 5 a. m. Steamship S. B. Souder, September 30th, about 20 miles north of Tortugas, reports barometer falling during the day, with a high southeast wind, apparently in the northeast section of a cyclone moving northwestward. Schooner Sarah Hall, (from Pensacola, September 26th, for Egmont Key Light,) reports at noon, September 30th, lat. 27° 37' N., long. 84° 17' W., expecting hurricane; at 6 p. m. hurricane commenced, wind ENE., with heavy rain, and continued until 4 a. m., October 1st, when wind moderated; at noon of the same day, lat. 27° 32' N., long. 84° 03' W. and at 5 p. m., terrific hurricane from south, continuing until October 3rd, noon, lat. 29° 22' N., long. 85° 14' W. Steamship Cochrane, (Cedar Key, October 1st for Key West,) reports, October 2nd to 4th, between Egmont Keys and Anclote Keys, heavy SW. cyclone; lowest barometer, 29.68. Schooner Georgietta reports struck a cyclone October 1st., lat. 26° 30' N., long. 84° W., off Egmont Key Light, wind ENE., gradually veering to WSW., blowing heavily until midnight of the 3rd. During the 1st and 2nd the observations at the Signal Service stations along the Gulf coast gave decided indications of the approaching cyclone, cloudy, threatening and rainy weather prevailing in the East Gulf and South Atlantic States, with brisk easterly winds veering to south and southwest in southern Florida; east and northeast winds from northern Florida to North Carolina, and northeast and north winds in Alabama and Mississippi. The Signal Service observer at St. Marks reports gale set in at 9:30 p. m., of the 2d, wind SE., heavy rain since morning. At 2 a. m., 3d, the tide rose above the level of the rain-gauge, up to which time over seven inches of rain had fallen since the morning of the 1st. The wind reached a velocity of 66 miles per hour at 5:15 a. m., of the 3rd, and the tide rose 12 feet above the mean; considerable damage was done throughout the adjacent country. Barometric readings were taken every fifteen minutes by the observer at St. Marks, and show a gradual decline until 6:15 a. m., of the 3rd, when the barometer read 29.17, the lowest reading recorded, wind SE.; after this the barometer gradually rose, the wind veering to SW. At Jacksonville, Fla., on the 2nd, the tide rose higher than it had been since the flood of 1871. During the 3d the storm passed northeastward over Georgia, the barometer reading 29.35 at 11 p. m., at Augusta, light rain and a calm prevailing. Heavy freshets were reported along the Altamaha and Savannah rivers, doing considerable damage to rice and cotton crops. Thence, during the night of the 3d and morning of the 4th, it passed over the Carolinas and Virginia, southeast gales prevailing along the coast, during which the Steamship Magnolia foundered off Cape Hatteras; the storm is reported as being terrific in the vicinity of Albemarle Sound, the attending floods carrying away

all bridges and wharves, and seriously damaging crops there and along the James river. During the afternoon of the 4th it passed centrally northeastward across Chesapeake and Delaware bays, where several wrecks occurred. Bark *Arcturus*, off Delaware breakwater, on the 4th, reports SE. gale, veering at 8 p. m. to NNW, hurricane. From Maryland to Connecticut the rain-fall was specially severe, and very serious damage was done throughout this section of the country. In southeastern Pennsylvania, northern New Jersey and along the Hudson River, passenger trains were wrecked by washouts, resulting in great loss of life and damage to property. On Long Island and in the Sound the storm was also very severe, several wrecks occurring, among which may be mentioned the Steamer *Massachusetts*, which went ashore shortly after midnight on the 4th, about five miles east of Horton's Point on the north shore of Long Island. On the morning of the 5th the storm-centre was probably about two degrees southeast of Cape Cod, and at midnight of the 5th, four or five degrees southeast of Cape Breton.

No. II.—This area appears to have passed eastward, north of the Gulf of St. Lawrence valley during the 1st.

No. III.—This area first appeared in the extreme Northwest on the morning of the 2nd, and during the day passed rapidly southward to Kansas; thence on the 3rd, northeastward over the Lake region into Canada, followed by brisk and high northerly to westerly winds, during which quite a large number of vessels were driven ashore on Lakes Michigan, Huron and Erie.

No. IV.—On the 5th the pressure was low in the Northwest, and by 4:35 p. m. of the 7th this area had passed rapidly southeastward to Missouri, preceded by rain in the central Mississippi valley and Upper Lake region; at 11 p. m. it was central in southern Illinois, and at 7:35 a. m. of the 8th, had passed northeastward to lower Michigan, passing thence, during the day, northward into Canada. During its progress over Michigan it produced southeast gales and rain over Lake Erie.

No. V.—This area, very similar to the last in the first part of its course, appeared in the Northwest on the afternoon of the 8th, progressed rapidly southeastward to Kansas by 11 p. m., and thence to Missouri and Iowa by 7:35 a. m. of the 9th. During the 9th and 10th it passed slowly eastward to Lake Erie; brisk to high northerly winds prevailing on Lakes Michigan, Huron and Erie, doing considerable damage to shipping; thence over New England on the 11th, and over Nova Scotia and Cape Breton on the 12th and 13th. Except in one or two instances, only light rain and winds accompanied this area, until the 12th, when heavy rain-falls were reported in the lower Canadian provinces, and a northeast gale prevailed in the lower St. Lawrence valley.

No. VI.—This, like the two preceding areas, first appeared in the Northwest. During the 11th falling barometer and southerly winds prevailed at Bismarck, the wind shifting to northwest by 7:35 a. m. of the 12th. This area then passed rapidly southward to Nebraska and Kansas by 4:35 p. m., where it remained central until 11 p. m. of the 13th, when it passed directly northward over Iowa and Minnesota during the 14th. During the 15th, and morning of the 16th, the pressures fell over the Lake region and New England, but it is somewhat doubtful if this can be connected with storm-track No. VI.

No. VII.—During the latter part of the 13th, and on the 14th and 15th, cloudy weather and heavy rains prevailed in the Southwest; warm southeast winds in Texas, and cold, brisk northerly winds in Kansas; the latter extended by the afternoon of the 15th over the northwestern portion of Texas and throughout the State, by the night of the 16th; several rain-falls of two to three inches were reported as occurring in this section during the eight hours preceding the 4:35 p. m. observation of the 16th; and at Indianola a heavy northeast gale and intense thunder-storm prevailed, the wind attaining a velocity of ninety-six miles per hour, and over four inches of rain falling. During the 17th and 18th northerly winds and rains continued to prevail from Texas northward, while southerly winds and heavy rains prevailed in the Lower Mississippi valley, the barometric trough forming low area No. VII stretching from Louisiana to Missouri at 4:35 p. m. of the 18th. The pressure continued rising in the Southwest, and at 4:35 p. m. of the 19th the central depression was in Illinois, heavy rains having fallen in the Lower Missouri valley. From this time until 11 p. m. of the 21st the centre of this storm progressed very slowly eastward, with decreasing central pressure, over the Ohio valley, West Virginia and Middle Atlantic States, with northeast gales and heavy rains on Lakes Superior and Erie. During the evening of the 21st brisk southerly winds and heavy rain prevailed on Chesapeake bay, and brisk and high easterly winds backing to northwest in New Jersey. The vortex passed northeastward along the Gulf Stream, with brisk northerly winds and rains along the coast of New England and Nova Scotia.

No. VIII.—The pressure commenced falling in the Northwest on the 21st, and on the 23rd, 24th and 25th a slight depression passed eastward to Pennsylvania, attended by light rain in the Lake region.

No. IX.—This area appeared in the Northwest on the morning of the 25th, with southeast winds in Minnesota, passed southeastward to southern Minnesota, with light rains, by 4:35 p. m., of the 26th, and thence over Lake Superior into Canada.

No. X.—Heavy rains and southeasterly winds prevailed in Texas during the evening of the 24th; nearly five inches of rain falling at Galveston. During the 25th very heavy rains and northerly to easterly winds prevailed along the Gulf coast from Indianola to Mobile, and possibly a slight depression existed in the Gulf of Mexico, which passed northeastward over northern Florida to the coast of North Carolina, by 11 p. m., of the 26th, as indicated by track No. X. St. Marks reports on the 26th in the afternoon a wind velocity of 40 miles.

No. XI.—This area is first noticed on chart No. II in Colorado, at 11 p. m., of the 27th; passed rapidly eastward over Kansas and thence northeastward to Lower Michigan by 11 p. m., of the 28th, and thence to the Gulf of St. Lawrence, where it was central on the night of the 29th. This depression was remarkable for its rapid progress only until it reached the lower St. Lawrence valley, where a southwest gale prevailed during the afternoon and night of the 29th.

No. XII.—This depression appeared north of Lake Superior on the 30th, progressed eastward and, at 11 p. m., of the 31st, was north of the lower St. Lawrence valley, but its track was too far to the north to be charted.

Storms at Sea.—The following notes have come to hand relative to storms at sea: On the 1st, hurricane at 27° 32' N. and 84° 3' W.; also, 26° 30' N. and 84° W. 2d, hurricane, 29° 22' N. and 84° 14' W.; gale, 49° 11' N. and 37° 48' W. 3d, gale, 53° 23' N. and 30° 03' W.; terrific gale at 34° 53' N. and 56° 30' W. 4th, violent gale, 40° 27' N. and 69° 43' W.; hurricane at 44° 30' N. and 69° 20' W.; gale, 51° 45' N. and 34° 50' W. 5th, gale, 35° 40' N. and 69° W. 6th, storm, 40° 32' N. and 69° 20' W. 7th, gale, 42° N. and 58° 05' W. 8th, gale, 41° 36' N. and 61° 10' W. 12th, gale, 47° N. and 46° 55' W. 14th, hurricane off Irish coast. 15th, gale, 55° 29' N. and 11° 20' W. 17th, gale, 33° 30' N. and 50° 57' W.; hurricane, 39° 14' N. and 56° 8' W. 19th, gale, 51° 32' N. and 40° 36' W. 20th, violent storm, 45° 14' N. and 39° 17' W. 21st, gale, 48° 08' N. and 34° 10' W. 22d, gale, 47° 29' N. and 39° 31' W. 24th, strong gale, 47° 54' N. and 45° 06' W.; gale, 48° 38' N. and 45° 30' W. 25th, hurricane, 49° 38' N. and 39° 42' W.; furious gale, 48° 35' N. and 28° 40' W. 27th, furious gale, 48° 09' N. and 24° W. 28th, furious gale, 48° 04' N. and 36° 10' W. 29th, heavy gale, 49° 31' N. and 35° 26' W. 31st, strong gale, 47° 44' N. and 43° 46' W.

TEMPERATURE OF THE AIR.

In General.—The distribution of the temperature of the air is shown by the isotherms on chart No. II. The table of comparative temperatures in the left-hand corner of the same chart, shows the month to have been warmer than usual over the whole country, except Canada, a portion of the Upper Missouri valley, Pacific coast and Rocky Mountain stations. Occasional voluntary observers, whose records extend back for many years, report, as follows: Genese, Ill., mean temperature of the month, 4° 2 above the mean for 16 years; Vevay, Ind., a mild, dry month; Martinsville, Ill., one of the warmest and driest on record; Gardiner, Me., the average temperature is 1° 55 below the average for the past 41 years; Plattsmouth, Neb., monthly average is 0.7 below the average for many years; Contoocookville, N. H., monthly average is 1° 3 above the average for many years; Cooperstown, N. J., the mildest October in 20 years; Volney, N. J., remarkable autumn; Newark, N. J., monthly mean is 3° above the average for 34 years; Williamsport, Pa., monthly mean 3° 6 above the average of 5 years; Tioga, Pa., warmest October for 11 years; Woodstock Vt., warmest October in 10 years. The month was, however, especially notable for the absence of severe frosts and the consequent development of the growth of vegetation.

Monthly mean temperatures, at special points, have been, as follows: Mt. Washington, 31° 6; Pike's Peak, 17° 0, Pembina, 40° 0.

Maximum and Minimum Temperatures.—Maximum temperatures, above 90°, are reported, as follows: 93° at Indianola, 94, Red Bluff; 95, Denison; 96, Masou; 98, Corsicana; 99, San Antonio; 101, Eagle Pass; 104, Brackettville.

Minimum temperatures below 25° have been reported as follows: 25° at Salt Lake City; 23°, North Platte; 21°, Boise City; 20°, Santa Fe; 19°, Pembina; 16°, Breckenridge; 14°, Winnemucca; 10°, Mt. Washington; 3°, Cheyenne; —6°, Pike's Peak.

Ranges of Temperature.—Large monthly and diurnal ranges have been respectively as follows: Brackettville, monthly, 68°, diurnal, 40°; Breckenridge, 54° and 42°; Cheyenne, 74° and 58°; Denver, 63° and 44°; Dodge City, 61° and 40°; Eagle Pass, 60° and 39°; Pembina, 49° and 42°; Winnemucca, 65° and 47°; Yankton, 48° and 40°. The smallest ranges have been: Cape Lookout, monthly, 28°, diurnal, 16°; Cape May, 29° and 18°; Charleston, 28° and 18°; Key West, 17° and 12°; New Orleans, 31° and 16°; Pike's Peak, 49° and 19°; Savannah, 33° and 20°; Tybee Island, 31° and 18°.

Frosts were reported by voluntary observers as follows: On the 1st in N. Y.; 3rd, W. Va.; 4th, Dak., Ill.,

Iowa, Kan., Minn., Mo., Neb.; 5th, Ark., Ga., Ill., Ind., Iowa, Kan., Ky., Md., Mich., Minn., Neb., N. C., Ohio, Pa., Tenn., Wis.; 6th, Ark., Conn., Dak., Del., Ga., Ill., Ind., Iowa, Ky., Me., Md., Mass., Mich., Minn., Neb., N. H., N. J., N. Y., N. C., Ohio, Pa., S. C., Tenn., Vt., W. Va., Wis.; 7th, Conn., Me., Md., Mass., Mich., Neb., N. H., N. J., N. Y., N. C., Ohio, Pa., Tenn., Utah, Vt., W. Va.; 8th, Conn., Kan., Mass., Mo., Neb., N. H., N. J., N. Y., Utah; 9th, Mass., Ohio; 10th, Iowa, Kan., Mo., Neb., N. C., Ohio, Va., Cal.; 11th, Ill., Ind., Iowa, Ky., Mo., Wis.; 12th, Ill., Ind., Ky., Mich., N. C., Ohio, Tenn., Wis.; 13th, Md., N. C., Tenn.; 14th, Me., Md., Mass., N. H., N. Y., N. C.; 15th, Ohio; 16th, Utah; 17th, Conn., Me., Mass., N. Y., Utah Ty., Vt.; 18th, Me., Mass., Utah Ty., Vt.; 19th, Ill., Utah Ty.; 20th, Dak., Me., Neb., Utah Ty., Wis., 21st, N. Y., Ill., Iowa, Kan., Mo., Neb., Utah Ty., Wis.; 22nd, Ark., Ill., Ind., Iowa, Kan., Mich., Miss., Neb., N. H., N. Y., Ohio, Tex., Wis.; 23rd, Ark., Tenn., Conn., Del., Ill., Ind., Kan., Md., Mass., N. H., N. J., N. Y., N. C., Ohio, Pa., S. C., Va., W. Va.; 24th, Ga., Ill., N. C., Ohio, S. C., Tenn.; 25th, N. H., N. Y., N. C.; 26th, N. Y., N. H., Pa., Vt.; 27th, N. Y., Mass., N. H., Utah Ty., Vt.; 28th, Conn., Mass., N. H., N. Y., Vt.; 29th, Ill., Iowa, Mo., Neb., N. H., Utah Ty., Wis.; 30th, Ill., Ind., Iowa, Neb., N. H., N. J., Ohio, Utah Ty., Wis.; 31st, Conn., Ill., Mass., Mich., Mo., Neb., N. H., N. Y., Ohio, Wis.

The frosts just enumerated were generally light, and the remarkable lateness of severe frosts is thus commented on by a few observers: at Vail, Iowa, on the 31st orange leaves still green; Fall River, Mass., cherry blossoms picked on the 21st; Freehold, N. J., wild violets in bloom on the 14th; Waterburg, N. Y., second crop of raspberries has been gathered; North Volney, N. Y., no killing frost up to the end of the month; Flushing, N. Y., apple trees in bloom and grass as green as in spring; Murphy, N. C., 31st, nothing injured by frost, beans in full bloom; Ringgold, Ohio, 31st, no severe frost as yet, vegetation uninjured; Chambersburg, Pa., no frost during the month, but a severe one Nov. 1st; Austin, Tenn., no heavy frost yet; Green Castle, Pa., flowers, tomatoes, pumpkins and locust trees are in bloom, no injurious frosts; Hulmeville, Pa., 24th, tomatoes ripe, and pepper plants in bloom; Lynchburg, Va., no frost during the month, tobacco almost matured for a second crop; Strafford, Vt., raspberries plentiful and ripe on the 15th, and strawberries in bloom, may-flowers seen on the 17th; Woodstock, Vt., colors of autumn foliage at their height one week later than usual; West Charlotte, Vt., red raspberries ripe 14th and 15th, dandelions in bloom on the 18th.

Ice was formed generally in connection with severe frost as follows: On the 3rd, Idaho; 4th, Dak., Iowa and Neb.; 5th, Minn., Dak. and Ill.; 5th, Iowa and Wis.; 7th, Mass., N. Y. and Utah Ter.; 8th, Utah Ter.; 10th, Neb.; 12th, Mich.; 16th, Utah Ter.; 19th, Me.; 20th, Iowa and Neb.; 21st, Iowa, Kansas, Mich. and Neb.; 22d, Ill.; 23d, Me., Conn., Mass., N. Y. and R. I.; 26th, Me.; 27th, N. H., Me. and Vt.; 28th, Conn., Mass., N. H., Idaho, Me. and Vt.; 30th, Neb. and Wis.; 31st, Mass. and Neb.

PRECIPITATION.

In General.—The general distribution of rain for the month is shown on chart No. III. The table in the lower left-hand corner gives the average precipitation in the various districts, and shows a very large excess in the Gulf and Atlantic States, the Upper Lake region, Northwest and in Oregon. This excess is to a great degree owing to the precipitation attending storms Nos. I, VII and X.

Special Heavy Rains.—The following notable cases of heavy rains that have been reported: 1st, Jacksonville, Fla., 3.29 in.; Quitman, Ga., (1st, 2d, 3d.) 8.90 in. St. Marks, Fla., (1st, 2d, 3d.) 7.28 in. 3d, Charleston, N. C., 1.75 in.; Duluth, Mich., 1.51 in.; Tybee Island, Ga., (2d, 3d.) 2.65 in.; Augusta, Ga., 2.13 in.; Savannah, Ga., 2.93 in.; Oglethorpe Bks., Ga., 2.56 in.; Mt. Forest, Canada, 2.33 in.; Mayport, Fla., 6.32 in., making a total of 11.08 in. in 10 days. 4th, Baltimore, Md., 2.74 in.; Cape Lookout, N. C., 1.85 in.; Lynchburg, Va., (3d, 4th.) 5.43; New Haven, Conn., (4th, 5th.) 4.05 in.; New York City, 4.02 in.; Philadelphia, Pa., 2.73 in.; Springfield, Mass., (4th, 5th.) 3.77 in.; Wilmington, N. C., (3d, 4th) 2.55; Washington, D. C., 3.98 in.; Gainesville, Ga., 2.30 in.; Fort Whipple, Va., 4.30 in.; Sandy Hook, N. J., 3.26 in.; Willets Point, N. Y., 2.17 in.; Accotink, Va., 4.00 in.; Barnegat, N. J., 2.08 in. 5th, Boston, Mass., 4.00 in.; New London, Conn., 2.77 in.; Newport, R. I., 2.03 in.; Portland, Me., 1.71 in.; Thatcher's Island, Mass., 3.19 in.; Fort Adams, R. I., 2.90 in.; Fort Hamilton, N. Y., (4th, 5th.) 4.90 in. 7th, Denison, Tex., 2.02 in. 8th, Alpena, Mich., 2.06 in.; Fort Hamilton, N. Y., (8th, 9th.) 2.06 in. 9th, Cape May, N. J., 1.97 in.; Philadelphia, Pa., 2.17 in.; Willets Point, N. Y., 1.25 in.; Barnegat, N. J., 2.83 in. 10th, Eastport, Me., 2.05 in.; Alpena, Mich., (10th, 11th.) 5.17 in. 11th, Buffalo, N. Y., 2.03 in. 13th, in vicinity of San Diego, Cal., first rain of season occurred, being the heaviest rainfall for twenty years; it seems to have passed from the southeast to northwest over a tract of country thirty to forty miles wide, extending from the coast far beyond the mountains to the north-east. 14th, Beckenridge, Minn., 2.25 in.; Denison, Texas, 4.00 in. 15th, Fort Gibson, Indian Ter., 1.81 in.; Galveston, Tex., (15th, 16th.) 3.68 in.; Fort Sill, Ind. Ter., 3.23 in. 16th, Corsicana, Texas, 2.12 in.; Indianola, Texas, 4.11 in.; Shreveport, La., 2.29 in.; Baton Rouge Bks., La., 2.05 in. 18th, Baton Rouge Barracks, 6.70 in. 19th, Chicago, Ill., 2.19 in.; Detroit, Mich., 2.02 in.; Anna, Ill., 2.88

in.; Sandusky, Ohio, 2.42 in.; Toledo, Ohio, (19th and 20th,) 3.52 in. 20th, Fort Porter, N. Y., 2.14 in. 21st, Norfolk, Va., 2.27 in.; Omaha, Neb., 2.14 in.; Cape Henry, Va., 2.28 in. 22d, Wood's Holl, Mass., 2.63 in. 25th, New Orleans, La., 2.53 in.; Mt. Sterling, Ill., 2.20 in.; Galveston, Texas, (24th and 25th,) 9.43 in.; Baton Rouge Barracks, La., 2.50 in. 26th, Norfolk, Va., 1.97 in.; Smithville, N. C., 2.20 in. 29th, Vicksburg, Miss., 1.94 in.; Baton Rouge Barracks, La., 2.60 in. 30th, New Orleans, La., 3.52 in., Indianola, Texas, 3.24 in.; Galveston, Texas, 2.12 in.; most of the smaller rain-falls here noted fell in the course of a few hours.

Large Monthly Rain-falls.—The following stations report large monthly rain-falls: Galveston, 17.39 inches; Alpena, 13.18 in.; Indianola, 11.75 in.; Denison, 10.74 in.; New Haven, 10.09 in.; Pilot Point, 10.42 in.; St. Marks, 10.61 in.; Baton Rouge, 16.75 in.; Quitman, Ga., 13.03 in.; Auburn, N. H., 13.15 in.; White Plains, N. Y., 18.09 in.; Pelham, N. Y., 10.43 in.

Small Monthly Rain-falls.—The following stations report little or no rain during the month: Camp Verde, 0.43 inches; Eagle Pass, 0.35 in.; Edinburg, 0.32 in.; Florence, 0.49 in.; Phoenix, none; Stanwix, none; Tucson, 0.46 in.; Winnemucca, 0.02 in.; Wickenburg, none; Yuma, none; Alcatraz Island, 0.40 in.; Salinas City, 0.12 in.

Droughts.—The distribution of rain, as given on the accompanying chart, shows slight deficiencies of rain to have occurred in the Ohio and St. Lawrence valleys; but no special reports of droughts, as affecting vegetation, have been received, except such notes as are referred to in the chapter on the height of water in rivers.

Floods.—Destructive floods attended the heavy rains, of the first four days of the month, in the East Gulf and Atlantic states, but in general, the excess of rain has served only to keep the streams very high and promote vegetation up to the last days of autumn.

Hail occurred on the 3rd, in Iowa, Mo.; 5th, Neb., N. Y.; 14th N. C.; 20th, Ky., Mo.; 22nd, Me., Mass.; 25th, Me., Tex., 26th, Neb., N. Y.

Snow.—Snow-falls during the month occurred as follows: on the 2nd, Dak.; 4th, Pa.; 5th, Wy. Ty., Wis.; 6th, N. Y., Pa., Wy. Ty., Vt.; 8th, Mich.; 10th, Ind.; 11th, Col.; 12th, Col., Wy. Ty.; 13th, Col., Wy. Ty.; 14th, Dak., Neb., Wy. Ty.; 15th, Wy. Ty., Neb.; 18th, Col., Neb., Wy. Ty.; 19th, Col., Neb., Wy. Ty.; 20th, Wy. Ty.; 21st, Me.; 22nd, Me., Mass., N. H., N. Y., Ohio, R. I.; 23rd, Pa.; 25th, Me., N. Y.; 26th, Me., Wy. Ty.; 27th, Col., Neb.; 28th, Col., Neb., Utah, Wy. Ty.; 29th, Col., Wy. Ty.; 30th, Col., Minn., Wy. Ty.; 31st, Col., Neb., Wy. Ty. At the end of the month snow was one to three inches deep in Utah and Nevada, and four inches deep in Vermont. Two feet of snow had fallen on Pike's Peak at the end of the month, where winter had set in unusually early.

Rainy Days.—The number of days on which rain has fallen as recorded by Signal Service observers ranges as follows: For New England, 15 to 18; Middle Atlantic States, 11 to 18; Lower Lake region, 15 to 19; Tennessee and the Ohio valley, 10 to 15; South Atlantic and East Gulf States, 9 to 15; West Gulf coast, 12 to 13; Upper Mississippi and Lower Missouri valleys, 5 to 13.

Cloudy Days.—The number of cloudy days is reported by volunteer observers as follows: New England, 5 to 14; Middle States, 13 to 19; South Atlantic States, 6 to 10; East Gulf States, 8 to 20; West Gulf States, 12 to 15; Tennessee and the Ohio valley, 6 to 10; Lower Lakes, 10 to 12; Upper Lake region, 13 to 18; the Northwest, 10 to 20.

RELATIVE HUMIDITY.

The average relative humidity for the month ranges about as follows: For New England, 71 to 78; Middle Atlantic States, 70 to 76; South Atlantic States, 63 to 79; East Gulf States, 72 to 79; West Gulf coast, 73 to 81; Western Texas, 54 to 75; Tennessee and the Ohio valley, 65 to 72; Lower Lakes, 68 to 79; Upper Lakes, 69 to 82; Upper Mississippi valley, 70 to 75; Lower Missouri valley, 70 to 74; the California coast, 71 to 74; the Sacramento valley, 42 to 49. High stations report the following average percentages, not corrected for altitude: Cheyenne, 61; Denver, 50; Mt. Washington, 90; Pike's Peak, 66; Salt Lake City, 41; Santa Fé, 48; Winnemucca, 39.

WINDS.

In General.—The prevailing winds at Signal Service stations, are shown by the arrows on Chart No. II, from which it will be seen that they have been southeasterly west of the Lower Mississippi; northerly in the Northwest and Upper Lake region; southerly in the Lower Lake region and Middle States; and northerly in New England, the South Atlantic and East Gulf States.

Total Movements.—The largest total movements for the month, have been, as follows: Barnegat, 10,208 miles; Cape Henry, 10,356; Cape Lookout, 10,814. Cape May, 12,212; Dodge City, 10,078; Indianola,

10,181; Pike's Peak, 13,658; Sandy Hook, 11,302; Sandusky, 10,484. The smallest movements have been, as follows: Augusta, 2,734 miles; Boise City, 1,942; Knoxville, 2,346; Lynchburg, 2,065; Nashville, 1,971; Visalia, 1,833.

Highest Velocities, in miles per hour, have been as follows: Barnegat, E., 60, 21st; Cape Henry, NW., 58, 4th; Cape Lookout, SE., 54, 4th; Cape May, NW., 68, 4th; Dodge City, NE., 60, 3rd; Fort Gibson, S., 50, 14th; Fort Whipple, SE., 60, 4th; Indianola, NE., 96, 16th; Mt. Washington, NW., 102, 23rd; North Platte, SE., 60, 2nd; Pike's Peak, W., 65, 26th; Philadelphia, SE., 60, 4th; St. Marks, SE., 65, 3rd; Washington, NW., 55, 4th.

Local Storms, Tornadoes, &c., as distinct from extended storms, have been reported as follows: 3rd, Louisiana, Mo., severe storm of wind and rain. 7th, Mesquite, Texas, at 3 a. m., a local storm lasting nearly one hour, moving toward ESE., 12 miles wide; houses blown down. 13th, Mare Island, Cal., high wind and thunder-storm. 16th, whirlwind in the bay at Wood's Holl. 30th, Farmington, Utah, very high wind.

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily weather indications, with the telegraphic reports for each succeeding twenty-four hours, shows a general percentage of omissions of 0.3 per cent., and of verifications of 84.6 per cent. The percentages of verifications for the four elements have been: weather, 91.2; wind direction, 82.4; temperature, 84.8; barometer, 80.1. The percentages of verifications by geographical districts have been: New England, 83.5; Middle Atlantic States, 88.7; South Atlantic States, 86.1; East Gulf States, 89.6; West Gulf States, 83.6; Lower Lake region, 80.8; Upper Lake region, 83.2; Tennessee and Ohio valley, 86.6; Upper Mississippi valley, 83.7; Lower Missouri valley, 80.3. Of the 3,708 predictions that were made, 121, or 3.3 per cent., are considered to have entirely failed; 89, or 2.4 per cent., were one-fourth verified; 555, or 15.0 per cent., were one-half verified; 378, or 10.3 per cent., were three-fourths verified; 2,565, or 69.0 per cent., were wholly verified.

Cautionary Signals.—During the past month 213 Cautionary Signals have been displayed at 47 stations on the coasts of the United States, of which 173, or 81.2 per cent., were reported verified within 100 miles of the station. Thirty-two cases of high winds were reported from these stations, for which signals were displayed too late or not at all.

NAVIGATION.

Stages of Water in Rivers.—In the table on Chart No. III, are given the highest and lowest readings on the Signal Service river gauges. It will be seen that the rivers have all been quite low, and the Ohio so low as to impede navigation. The highest stages occurred after the 15th, and up to the close of the month. *Special reports* as follows: Roanoke river, North Carolina, very high on the 6th, 7th and 8th, within 3 feet 9½ inches of the great freshet of 1873. *Muscatine*, Iowa, 31st, river at low-water mark. *Pittsburgh*, river lowest for 30 years. *Keokuk*, river very low; navigation suspended above this point. *Omaha*, the channel of the Missouri has approached the Nebraska shore. *Shreveport*, the upper Red river and tributaries all very high.

TEMPERATURE OF WATER.

In General.—The temperatures of water, as observed in rivers and harbors, are shown on the Chart No. III.

Maximum and Minimum Temperatures.—The highest maxima have been 84° at Galveston and Key West, 83° at Shreveport, 77° at Nashville and 76° at St. Marks and Cairo. The lowest minima have been 44° at Alpena, 45° at Cleveland, Duluth and La Crosse, and 46° at Eastport, Omaha and Yankton.

Ranges of Temperature.—The least ranges have been: 3° at Key West and San Francisco, 4° at Eastport and 5° at Charleston, Jacksonville, Wilmington and St. Paul. The largest have been 25° at Cleveland, 21° at La Crosse and 20° at Alpena, Galveston, Grand Haven, Omaha and St. Louis.

ATMOSPHERIC ELECTRICITY.

Thunder-storms occurred as follows: On the 1st in Iowa, Mich., Mo., Vt., Wis. 2nd, Dakota, Iowa, Kan., Wis. 3rd, Ill., Iowa, Kan., Mich., Mo., Neb., Tex., Wis. 4th, Canada, Wis. 5th, Mass. 7th, Kan., Tex. 8th, Neb. 9th, Ill., Ind., Iowa, Ohio, Wis. 10th, Md., Va. 12th, Ill., Iowa, Neb., Col., Wash. Ty. 13th, Cal., Ill., Iowa, Kan., Mich., Neb. 14th, Iowa, Mich., Neb., Wis. 15th, Tex., Iowa, Kan., Neb. 16th, Tex. 18th, La., Canada, Ill., Tex. 20th, Ill., Ind., Ky., Md., N. C., Ohio, Pa., W. Va., Mo., Va. 21st, Del., Md., Mass., N. J., Va., Pa. 22nd, Conn., Mass. 24th, Tex. 25th, Iowa, Tex. 26th, Fla., Iowa, Neb. 27th, Iowa. 29th, Canada, Tex., Vt. 30th, La.

Distant lightning was reported as follows: On the 1st in Ill., Iowa, Kan., Mich., Mo., N. H., N. Y., Ohio, Vt., Wis. 2nd, Iowa, Kan., Neb., N. Y., Vt., Fla., Tenn. 3rd, Iowa, Mich., Mo., Tex. 4th, Tex. 5th, Me. 6th, Ind., Kan., Tex. 7th, Tex. 8th, Dak., Iowa, Kan., Neb. 9th, Ind., Wis., Mo. 10th, Md., Pa., Va., Ga. 11th, N. C. 12th, Ill., Ind., Iowa, Kan., Neb. 13th, Ill., Ind., Iowa, Kan., Mich., Tex. 14th, Mich., Tex. 15th, Kan., Tex. 16th, Tex. 19th, Tex. 20th, Ky., Md., Pa. 21st, Md., N. J., Pa., Va., Ohio. 25th, Fla. 26th, Neb. 27th, Neb. 29th, Tex., La. 30th, Tex. 31st, Fla.

Auroras were observed on the 1st in Minn.; 2nd, Ill.; 4th, Mich.; 11th, Conn., Ill., Iowa, Mass., N. J., Ind., Mich., Minn., Va., Me., Wis.; 12th, Me.; 15th, Iowa; 16th, Me.; 18th, Dak.; 26th, Wis.; 27th, Me., N. H.; 30th, N. Y.; 31st, Wis.

OPTICAL PHENOMENA.

Solar halos were observed on the 1st in Ill. 2nd, Ohio. 4th, Mo., R. I. 6th, Ky. 7th, N. Y. 8th, N. H., R. I. 11th, Neb. 12th, Mich., Ohio. 13th, Ohio, Ky. 14th, S. C. 15th, Iowa, N. Y. 16th, Ill., N. Y. 17th, Ind., N. Y., Ohio, Ky. 18th, Ohio. 20th, Me. 21st, Iowa, Me. 23rd, Iowa, N. Y. 24th, Ill., Ind., Iowa, Mich., N. H., N. Y., Ky., R. I. 25th, Ind., N. Y., Ohio, R. I. 28th, Ill. 29th, Ill., Mich., Ohio. 30th, Ill., Ind., Ohio, Ky. 31st, R. I.

Lunar halos were observed as follows: On the 10th in Md. 12th, Va. 13th, Mo., N. J., Va., Ga., S. C. 14th, Ind., Mo., Neb., N. Y., Va., Pa. 16th, Ill., Iowa, Kan., Va., Pa. 17th, Ill., Ind., Me., Neb., N. J., N. Y., N. C., Ohio, Pa., Va., Md., Ky. 18th, Mass., N. C., Pa., Tenn. 19th, N. J., N. Y., N. C., Pa., Va., Wis. 20th, Iowa, Va., S. C. 21st, Mich. 23rd, Ill., Iowa, Mo., Neb., Tex., Wis., Mich. 24th, Ind., Ky., Md., N. H., N. J., N. Y., Ohio, Pa., Tex., Va., Ga., S. C., W. Va. 25th, Kan., Ky., W. Va. 26th, Utah, Ky. 27th, Va. 29th, N. Y., Pa. 30th, Ind., Ohio. 31st, N. Y.

Mirage was observed on the 8th in Kan. 9th, S. C. 21st, Dak. 22nd, Kan. 29th, Dak. At New London, 14th to 18th, and 25th to 28th.

MISCELLANEOUS PHENOMENA.

BIRDS.—*Blackbirds* were seen on 7th at Oregon, Mo.; 11th, last seen, Contoocookville, N. H.; flying S., 6th, Palermo, N. Y.; 3d, Wappinger's Falls, N. Y.; 10th, Jacksonburg, Ohio; flying W., on 21st, Austin, Tenn. *Blue jays* going south, 11th, Creswell, Kan.; first seen 21st, Belmont Farm, Texas. *Blue birds and Ground Sparrows* last seen on 31st, Contoocookville, N. H. *Blue-birds*, 27th, Palermo, N. Y.; 31st, flying S., Kensico, N. Y.; first seen, 22d, Belmont Farm, Texas. *Buffalo birds*, large flocks going S., 5th, Creswell, Kan. *Crows*, flying S.; 11th, 12th, Genoa, Neb.; 26th, Palermo, N. Y. *Cranes*, flying S.; 29th, Baxter Springs, Kan.; 21st, Sedgwick, Kan.; 20th, Emerson, Neb.; 11th, Clear Creek, Neb.; 21st, Belmont Farm, Texas; flying S. W. 20th, Creswell, Kan. *Ducks*, flying N.; 12th, Lower Brule Agency; plentiful, 20th, Farmingdale, N. Y.; flying S., 29th, 30th, 31st, Daytona, Fla.; 2d, Frankford, Mo.; 29th, 31st, Belmont Farm, Texas; 22d, Morgantown, West Va.; numerous, 10th, Oregon, Mo. *Wild ducks* seen on 25th, New Bedford, Mass. *Eagles*, flying S., 5th, Sedgwick, Kan. *Geese*, flying S., daily, 3d to 31st, Lower Brule Agency; 31st, Milford, Del.; 21st, Hennepin, Ill.; 29th, Louisville, Ill.; 2d, Elmira, Ill.; 8th, 20th, Milford, Ind.; 31st, Laconia, Ind.; 1st, 20th, Afton, Iowa; 10th, Guttenburg, Iowa; 26th, Cresco, Iowa; 10th, Nora Springs, Iowa; 22d, Tabor, Iowa; 1st, Boonshoro, Iowa; 29th, Baxter Springs, Kan.; 2d, 17th, 19th, 24th, 26th, 28th, 29th, Creswell, Kan.; 18th, 19th, Sedgwick, Kan.; 17th, Independence, Kan.; 26th, Lawrence, Mass.; 23d and 24th, Detroit, Mich.; 22d, Northport, Mich.; 2d, Frankford, Mo.; 20th, Emerson, Neb.; 1st, Plattsmouth, Neb.; 5th, 24th, 28th, 29th, and 31st, and very numerous at Clear Creek, Neb.; 24th, Contoocookville, N. H.; 29th, Oregon, Mo.; 21st, Freehold, N. J.; 27th, Ardemia, N. Y.; 13th, Palermo, N. Y.; 23d, Penn Yan, N. Y.; 21st, 26th, Farmingdale, N. Y.; 26th, Wappinger's Falls, N. Y.; 11th, Bellefontaine, Ohio; 29th, Westchester, Pa.; 22d, Tioga, Pa.; 13th, Franklin, Pa.; 24th, Hulmeville, Pa.; 21st and 26th, Austin, Tenn.; 1st, 28th, 31st, Belmont Farm, and numerous 21st, 22d; 27th, Embarrass, Wis.; 21st, 29th, Corsicana, Texas; 10th, Breckenridge, Minn.; 22d, Leavenworth, Kan.; 23d, Vicksburg, Miss.; 29th, Cincinnati, Ohio; 20th, Morgantown, West Va.; flying S. W., 24th, Laconia, Ind.; flying W., 23d, Northport, Mich.; flying W. S. W., 13th, and N. W. 18th, North Volney, N. Y.; numerous 25th, Olivet, Dakota; flying N., 22d, 23d, Waterburg, N. Y.; 3d, Corsicana, Texas; flying N. W., 11th, Montana, Wis.; flying S. E., 2d, Green Castle, Pa.; flying S. S. W., 20th, and S. E. 21st, at Alto Vista, Va. *Humming birds*, last seen on 1st and 3d, Oregon, Mo. *Pelicans*, flying S., 27th, Oregon, Mo. *Robins*, last seen 16th, Creswell, Kan.; 24th, Contoocookville, N. H.; 18th, Palermo, N. Y.; 24th, Penn Yan, N. Y.; departing 7th at West Charlotte, Vt. and entirely disappeared, together with phoebes and sparrows, after the 24th. *Swallows*, last seen 13th, Wappinger's Falls, N. Y. *Chimney swallows* leave Jacksonburg, Ohio, 14th. *Snow-birds*, first seen 20th, Bellfontaine, Ohio; 24th, Bethel, Ohio; 24th, Jacksonburg, Ohio; 25th, Ringgold, Ohio.

INSECTS.—*Bees* and *butterflies*, flying about, 23rd, Louisville, Ill.; first seen, 21st, Belmont Farm, Tex.

Frogs, grasshoppers and crickets, singing on 13th and 24th, Oregon, Mo. *Katy-dids*, singing on the 29th, Freehold, N. J.; last heard, 25th, Wappinger's Falls, N. Y. *Hessian fly*, has injured the wheat worse than ever before at Martinsville, Ill.

BOTANICAL.—*Osage orange*, still green, 31st, Vail, Iowa. *Morello Cluny tree*, in bloom on the 14th, Oregon, Mo. *Rose bush*, full bloom, 31st, Belmont Farm, Tex. *Wild mustard*, in blossom on the 31st, Vail, Iowa.

Polar Bands.—15th, Southington, Conn.; 2nd, 28th and 30th, St. Mary's Home, Ind.; 1st and 24th, Iowa City, Iowa; 6th, 8th, 27th, 29th and 30th, Tabor, Iowa; 24th, Danville, Ky.; 30th, Gardiner, Me.; 17th, Contoocookville, N. H.; 19th, Auburn, N. H.; 14th, Jacksonburg, Ohio; 30th, Cannonsburg, Pa.; 24th, Woodstock, Vt.; 9th, 17th and 21st, Wytheville, Va.

Sun-sets.—The characteristics of the sky, as indicative of approaching fair or foul weather, have been observed daily at all regular Signal Service stations. Reports from 108 stations show 69 blank or doubtful cases; for the remaining 3,112 cases, 2,616 (or 84.2 per cent.) were followed by the anticipated weather.

Prairie and forest fires or smoke, daily, from the 6th to the 31st, at Pembina and Lower Brule Agency, Dak.; 28th, Fort Larned, Kan.; 22nd and 28rd, Olivet, Dak.; 4th and 26th to 31st, daily, Creswell, Kan.; 24th and 25th, Somerset, Mass.; 24th, Waltham, Mass.; 12th, 22nd, 23rd, 24th and 31st, Clear Creek, Neb.; 23rd, Genoa, Neb.; 27th, 29th, 30th and 31st, Oregon, Mo.; 17th, Westville, Ohio; 20th to 31st, very extensive near Bismarck, Dak.

Meteors were observed on the 1st in Conn., Md., Mass., N. Y.; 2nd, Md., Mass., N. J., N. Y., Ohio, Pa.; 3rd, N. Y., Pa.; 5th, Md., Mass., N. Y.; 6th, Me., S. C.; 7th, Md., N. Y., Idaho; 9th, Mass.; 11th, Md., Mass., N. J.; 13th, Ind., Iowa, N. J.; 13th, Md.; 15th, Ind., Pa.; 16th, Ind., N. Y., Pa.; 17th, N. Y., Vt.; 18th, Minn.; 22nd, Iowa, N. Y.; 23rd, Conn., Kan., Minn., Tex.; 24th, N. J., Ga.; 27th, Ohio; 28th, Ind.; 29th, Iowa; 30th, Conn., La., Me., Md., Pa.; 31st, Ill., Ind., N. Y., Ohio.

Zodiacal Light.—30th and 31st, Southington, Conn.; 18th and 19th, in mornings, Daytona, Fla.; 6th, 9th, 11th, 13th to 17th, at St. Mary's Hospital, Ind., and 1st, 5th, 6th, 7th and 28th at Cambridge, Mass.

Earthquakes have been noted as follows: on the 12th, quite severe shocks were felt in Oregon, occurring at Portland, at 1:53 p. m.; at Marshfield, Clackamas Co., at 1:45 p. m., and at Cascade City, at 9 a. m. and 1:52 p. m. Shocks were also felt at Hubbard and at points down the Columbia river. The vibrations were from north to south at Portland; several windows were broken and two chimneys thrown down. 3:26 a. m., slight earthquake shock felt all over the Isthmus of Panama. October 9th, 2 a. m., earthquake shocks felt at Lima and Callao; vibrations from north to south, lasting one minute, and at 2:20 a. m., two shocks were felt in Pisco, Ica and Chincha.

SOLAR PHENOMENA.

Sun spots.—The following observations, made by Mr. D. P. Todd, upon the spots of the sun, have been kindly communicated by Rear Admiral John Rodgers, U. S. N., Superintendent of the Naval Observatory:

Oct., 1877.	No. of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		Remarks.
	Groups	Spots.	Groups	Spots.	Groups	Spots.	Groups	Spots.	
2nd, Noon....	0	0	0	0	0	0	0	0	Large group of faculae.
5th, 11 a. m....	0	0	0	0	0	0	0	0	
6th, 11 a. m....	0	0	0	0	0	0	0	0	
7th, 2 p. m....	0	0	0	0	0	0	0	0	Extensive mottling over the solar surface.
10th, 11 a. m....	0	0	0	0	0	0	0	0	
3 p. m....	0	0	0	0	0	0	0	0	
3 p. m....	0	0	0	0	0	0	0	0	Surface somewhat mottled—"veiled spots."
11th, 3 p. m....	0	0	0	0	0	0	0	0	
12th, 11 a. m....	0	0	0	0	0	0	0	0	
13th, 3 p. m....	0	0	0	0	0	0	0	0	Faculae and mottling.
14th, 3 p. m....	0	0	0	0	0	0	0	0	
15th, 11 a. m....	0	0	0	0	0	0	0	0	
15th, 4 p. m....	0	0	0	0	0	0	0	0	Largest spot about 25" in diameter; readily visible to the unassisted eye.
16th, 4 p. m....	0	0	0	0	0	0	0	0	
17th, 4 p. m....	0	0	0	0	0	0	0	0	
18th, 4 p. m....	0	0	0	0	0	0	0	0	
22nd, 3 p. m....	0	0	0	0	0	0	0	0	
23rd, 11 a. m....	0	0	0	0	0	0	0	0	
23rd, 4 p. m....	0	0	0	0	0	0	0	0	
31st, 3 p. m....	2	30	0	0	0	0	2	30	

Prof. Hinrichs, of Iowa City, reports that the sun was almost free from spots until the 27th, when a spot of very large size appeared, followed by smaller ones in two distinct groups.

NOTES AND EXTRACTS.

Mr. J. H. C. Coffin, of the United States Steamer Monocacy, reports disturbances of the ocean at Nagasaki, Japan, on August 21st, 1877 as follows:

"The flood-tide had been making sometime, and at 4:45 p. m. it was nearly high water. At this time it was noticed that the water was rapidly running out, carrying with it a number of small junks and boats, at the rate of six or seven knots; it continued to run out for twenty minutes, the water in this time falling six feet. At 5:05 p. m. the water returned with a much greater velocity than it had run out, the water rising to its former height. At 5:13 p. m. the second recession commenced and continued for twenty minutes, the water falling as before. At 5:33 it came in again with about the same velocity as before, and rose a foot higher than before. At 5:45 p. m. the third recession commenced, the water falling about three feet, and then seemed to stop for a few moments and fall again, about two feet more. At 6:05 p. m., commenced to run in again, strong at first but slower afterwards. At 6:30 the water was about a foot lower than the former wave, and it remained at this height. The weather had been warm and calm, the barometer steady at 29.80 until 4:30 p. m., when it dropped slightly. There was no damage done in the harbor, the vessels at anchor swinging as the recessions took place. It is generally believed to have been caused by the breaking out of some volcano in the vicinity; it is a very unusual thing for Nagasaki, although they have experienced slight tidal waves in the harbor. Vessels outside noticed nothing unusual."

From a paper by Mr. G. J. Symons, F. M. S., "On the Climates of the Various British Colonies," the following very interesting table is taken:

Annual Climatological Data for the Principal British Colonies.

Name of Colony and Station.	Temperature.					Mean humidity.	Average rain-fall.
	Mean.	Absolute maximum.	Absolute minimum.	Absolute range.	Mean daily range.		
	°	°	°	°	°	Per Ct.	Inches.
London	49.0	95.0	5.0	90.0	15.6	82	25
St. Helena, Longwood.....	61.4	77.6	52.0	25.6	5.6	87	40
Cape of Good Hope.....	61.2	97.4	37.7	59.7	10.3	75	24
Natal	64.6	97.8	29.0	68.8	18.3	72	30
Mauritius.....	77.1	90.0	62.8	27.2	6.7	71	56
Bengal, Calcutta.....	79.9	100.0	52.7	53.3	13.2	76	66
Bombay.....	79.0	93.5	58.0	34.5	9.7	76	71
Madras.....	80.0	110.0	57.6	52.4	16.6	—	48
Ceylon.....	80.7	95.0	68.3	26.7	9.0	83	76
Straits Settlements.....	79.8	93.0	65.0	28.0	12.8	—	95
Queensland, Brisbane.....	70.0	108.0	34.5	73.5	20.9	76	51
New South Wales, Sydney.....	62.4	107.0	36.0	71.0	14.7	72	50
Victoria, Melbourne.....	57.5	111.2	27.0	84.2	18.8	72	26
South Australia, Adelaide.....	63.1	113.5	34.2	79.3	20.6	60	21
Tasmania, Hobart Town.....	54.4	105.0	29.0	76.0	17.9	75	23
New Zealand, Wellington.....	55.6	83.0	30.0	53.0	12.0	68	47
British Guiana.....	79.0	89.0	68.0	21.0	10.0	—	94
Barbadoes.....	75.0	85.0	64.0	21.0	6.8	83	67
British Honduras, Belize.....	80.0	88.0	58.0	30.0	3.0	—	71
Bermuda.....	71.0	95.0	46.0	49.0	14.0	80	48
Canada, Newfoundland.....	40.0	92.5	—21.0	113.5	14.4	—	55
Canada, Toronto.....	44.1	99.2	—26.5	125.7	16.6	77	36
Canada, Manitoba.....	31.3	95.0	—43.1	138.1	23.2	84	22
Canada, British Columbia.....	40.3	100.0	—29.0	129.0	19.3	62	—

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Albert J. Myer

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